Water Resources Planning in the Transition Economies: Influences on Water Quality in the Baltic Sea Region

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Introduction

This study examines the linkages between changes in water quality in the urban environment of a transition economy, that of Russia, and the economic and social changes of the transition period. My research question is the following: how and to what extent have the economic, social, and institutional developments of the transition period had an impact on the quality and management of water resources of a major urban center in a transition economy? I focus on the impact of economic transition on the management of industrial effluent and other wastewater and runoff sources in the urban environment of Northwest Russia. My study investigates quality changes in surface water during the 1990s in the St. Petersburg region relative to economic change, with a parallel analysis of changes in residential water use, in the infrastructure of water delivery, and in institutional setting.

The transition economies provide an unparalleled opportunity to examine the environmental effects of an abrupt and sustained reduction in industrial water pollution. The economic collapse of the transition economies in the 1990s was accompanied by a sharp reduction in industrial effluents, only sporadic investment in wastewater treatment infrastructure, and a slow but gradual increase in consumer demand. Despite significant investment in water treatment plants and delivery infrastructure, water remains far from potable in major cities of the transition economies.[1] In many cases, surface waters adjacent to those cities remain heavily polluted. Water resources are critical to the St. Petersburg region in terms of population health, economic development, and the management of other natural resources in the region.

Literature

One of the more serious water pollution sources in the St. Petersburg region is the absence of localized water treatment of industrial effluents. As a result, significant amounts of wastewater "containing specific industrial wastes" enter the city's three general wastewater plants.[2] Only one of the city's three treatments plants is working at its full planned capacity. About 2.2 million cubic meters of the city's wastewater receive a "full biological" treatment, which represents only about 75% of the total quantity of wastewater that is produced in the city.[3] From 1976 to 1985, smaller treatment plants were built in adjacent towns of Leningrad Oblast (including Petrodvorets, Pushkin, Kolpino, Sestrotetsk, Zelenogorsk, and Kronshtadt), but wastewater from those towns continue to remain a significant additional source of water pollution in the region. Widely recognized immediate goals in St. Petersburg and its adjoining towns that need to be met in terms of water resources planning include: (1) reduction in the release of untreated wastewater; (2) improvement in quality of surface water used for drinking water source; and (3) improvement in the quality of the water delivery system.[4]

The city of St. Petersburg has been identified as the biggest single point-source polluter within the Baltic Sea region.[5] Epidemiological investigations of St. Petersburg's water quality indicate a continuing highly unhealthy level of bacterial pollution.[6] Other problems include outdated water treatment technology, frequent breakdowns, leakages and water contamination due to obsolete and corroded pipeline systems. The deterioration of the water supply and wastewater treatment conditions in the transition economies has resulted in health conditions in Russia that are close to those of developing countries.[7] Lake Ladoga, the largest lake in Europe, serves a variety of functions for St. Petersburg and Leningrad Oblast: the main drinking water supply for St. Petersburg's 4.6 million population, a source of water for industry and agriculture, and an important waterway for navigation. The water quality of Lake Ladoga had deteriorated significantly by the late decades of the Soviet period. The water quality of Lake Ladoga improved slightly in the early and mid 1990s, due largely to agricultural and industrial effluent declines, but the lake remains under significant environmental pressures today.[8]

Economists have sought to quantify the decline in industrial production during the transition period, and water resource specialists in Russia have monitored water quality, but an in-depth investigation of the correlation of the economic and social trends with the water quality on a regional scale does not yet exist. Peterson hypothesized the existence of a rise in pollution intensification in the transition economies during the 1990s, finding that pollution was falling at a smaller marginal rate relative to unit of economic decline in the transition economies.[9] Pollution intensification suggests that the transition economies are failing to realize environmental improvements as they restructure their economies, shift output to new sectors, and invest in new technologies. Oldfield's national-level review of economic and pollution statistics in

Russia, one of only a small number of analyses of trends in pollution intensification in Russia for the 1990s, confirms Peterson's thesis.[10] Crotty's regional-level study of air pollution in the Urals suggests a more complex set of determining factors of pollution intensification than economic indicators alone.[11] No regional study exists that has examined pollution intensification in Russia with a focus on water pollution.

Conceptual framework

Effective water resources planning could play a critical role in ameliorating the water quality of the St. Petersburg region. Yet a consistent characteristic, if not failure, of the transition period has been inadequate governance. Water resources planning consists of two main realms of activity: environmental protection of water sources, and delivery and treatment of those water sources.[12] Environmental protection of water resources requires the regular monitoring of resources and enforcement of polluters. The delivery and use of water resources involves the development and maintenance of an urban infrastructure for the effective delivery of water and subsequent wastewater treatment and disposal. Such management is all the more difficult in the midst of institutional change, of the erosion of regulatory authority, and of uncertain future economic conditions.

The transition period is also characterized by the failure of government and other agencies to provide a common vision for the many actors who are involved in water resource use and management in an urban environment. Lack of coordination between federal, state and municipal agencies during the last decade with regard to financing, operation, tariff collection, and management of water supply facilities has been one of the numerous challenges of the period. [13] A consideration of the integration of the different scales of water use, of its treatment, and of its release, and eventual environmental impact, is essential in evaluating the management of urban water resources use and planning in the transition economies. My study provides an examination of those different scales for the St. Petersburg region, and then considers the study's relevance at the scale of Russia as a whole, and for the transition economies at large.

Methodology

The first stage of my research focused on the collection of indicator data of the changes in water quality and identification of water quality trends both of surface water and in delivered drinking water. Those indicator data were available in the form of nitrogen, phosphorus, heavy metal, and other biological contaminant concentrations from those Russian agencies responsible for data collection.[14] A second stage of research involved collecting regional economic and social information on the wide range of socio-economic indicators of the period of economic transition, including GDP per capita, population trends (including the recent emergence of de-urbanization), and consumer spending. Those indicators are available from city-level statistical and related agencies. A third stage of the project consisted of a statistical and geographic analysis of the water use, quality, and economic data. A final stage of the project provided an examination of the institutional change that has taken place in terms of Northwest Russia's environmental protection, water resource management, and urban planning. Institutional change, infrastructure improvements, legislative requirements, and regulations were examined throughout the decade of the 1990s in Northwest Russia.

Conclusions

My research results indicate that despite lower industrial production in the early 1990s, which reduced the negative impacts on water resources in the region, renewed industrial production at the end of the 1990s (accompanied by an only minor investment in wastewater treatment infrastructure), increased consumer demands on water, and weakened environmental protection institutions, have left Northwest Russia's water resources at continued risk. My research findings suggest the validity of the thesis of increased water pollution intensification during the 1990s in the urban environment of Northwest Russia.

Study of the wide range of obstacles and difficulties that water resources planning has faced during the transition period can be highly instructive for Western researchers of Russia, Central Eurasia, and Eastern Europe. Those Western researchers who are conducting basic research on the region, or those researchers who are collaborating with policy-makers with direct influence on the outcome of developments in the region, stand to gain from such study. As one example of such possible gains, the recently renewed construction of the unfinished Kotlin anti-flooding dam (passing through the island of Kronshtadt in the Gulf of Finland to the west of St. Petersburg) represents a major urban project in the St. Petersburg region that is now receiving significant funding from a Western funding agency (European Bank for Reconstruction and Development). The environmental impacts of the construction project will be large and complex and cannot be ignored by Western funding agencies.

As Western nations are approached to help fund increasingly more urban infrastructure water projects of the transition economies, a better understanding of the impacts on water resources on many different scales from such projects is essential for Western as well as Russian researchers.

Notes

[1] Danilov-Danilyan, Victor I. (1998). Foreword of Kimstach, Vitaly, Michel Meybeck, and Ellysar Baroudy (1998). *A Water Quality Assessment of the Former Soviet Union*. London: E & FN Spon, p. xii; Zhulidov, Alexander V, *et al*. (2000). "Critical analysis of water quality monitoring in the Russian Federation and former Soviet Union," *Canadian Journal of Aquatic Science*, 57: 1932-1939.

[2] Sorokin, N.D. (2002) *Okhrana okruzhaiushchei sredy, prirodopol'zovanie i obespechenie ekologicheskoi bezopastnosti v Sankt-Peterburge v 2001 godu*. St. Petersburg: Administratsiia Sankt-Peterburga upravlenie po okhrane okruzhaiushchei sredy, p. 161.

[3] Ibid, p. 163.

[4] Ibid, p. 164.

[5] Budarin, V.F. (2000). "Dinamika sbrosa zagriazniaiushchikh veshchestv v vodnye ob'eky" in *Okhrana okruzhaiushchei sredy, pripodopol'zovnie i obespechenie ekologicheskoi bezopasnosti v Sankt-Peterburge za 1980-1999 gody*. Administratsiia Sankt-Peterburga upravelenie po okrane okruzhaiushchei sredy: St. Petersburg, pp 141-152.

[6] Ibid.

[7] OECD (2001). *Water Management and Investment in the New Independent States.* Paris: OECD, p. 74.

[8] Kondratyev, Sergey (1997). "Lake Ladoga: Water Resources for Sustainable Development of North-Western Russia and Finland," RSS grant N 1350/1997 (unpublished grant report).

[9] Peterson, DJ (1995). "Russia's Environment and Natural Resources in Light of Economic Regionalisation," *Post-Soviet Geography*, Vol. 36, 5, pp. 291-309.

[10] Oldfield, Jonathan (2000). "Structural Economic Change and the Natural Environment in the Russian Federation," *Post-Communist Economies*, Vol. 21, 1, pp. 77-90.

[11] Crotty, Jo (2002). "Economic Transition and Pollution Control in the Russian Federation: Beyond Pollution Intensification," *Europe-Asia Studies*, Vol. 54, 2, pp. 219-316.

[12] Conant, Francis, ed. (1983). *Resource Inventory and Baseline Study Methods for Developing Countries.* Washington, DC: American Association for the Advancement of Science.

[13] Ravi, pp. 34-35.

[14] Separate government agencies are responsible for measuring data, enforcement, and scientific study of the Neva-Lagoda basin. The first is the Direction, the second is Gydromet, and the third is the Institute of Limnology.

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